Planning for Sustainable Water Supplies for US Army Installations

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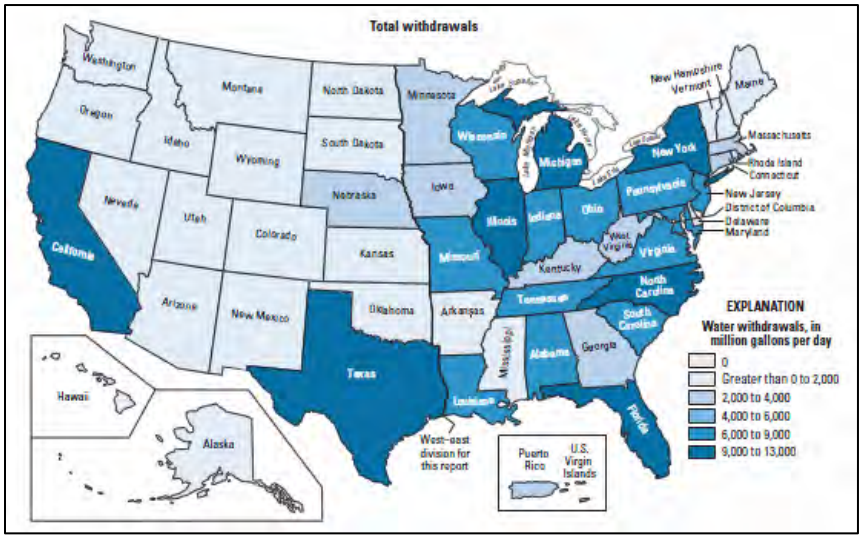
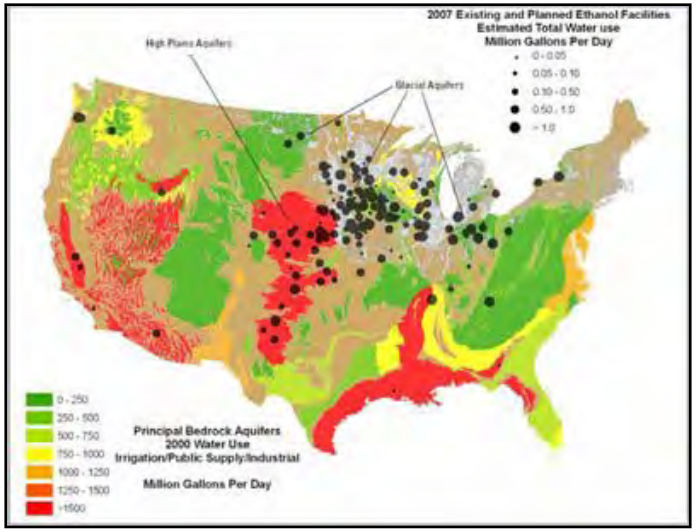
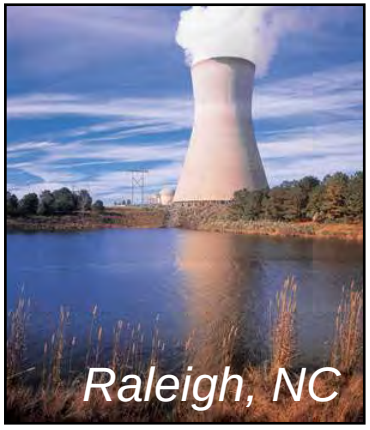
Energy/Water Nexus

- Thermoelectric power
- Geothermal
- Biofuels
- CSP i.e. Solar HW
- Hydropower
- Carbon Capture
- Fracking

Kenney et al 2009 (USGS)





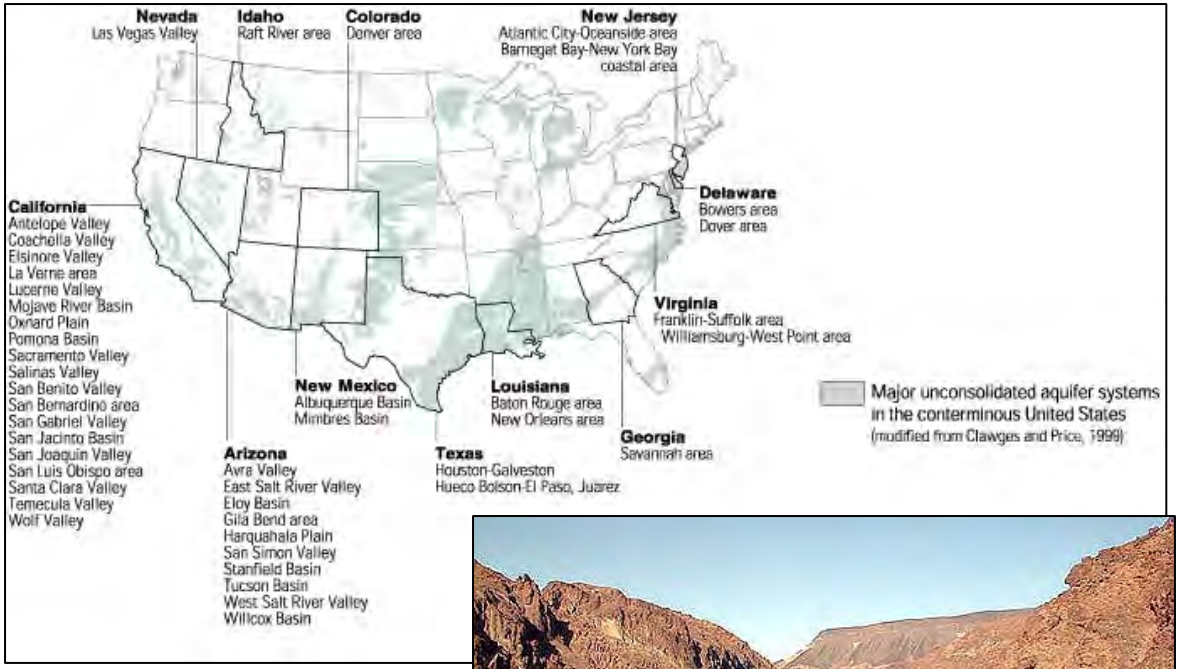


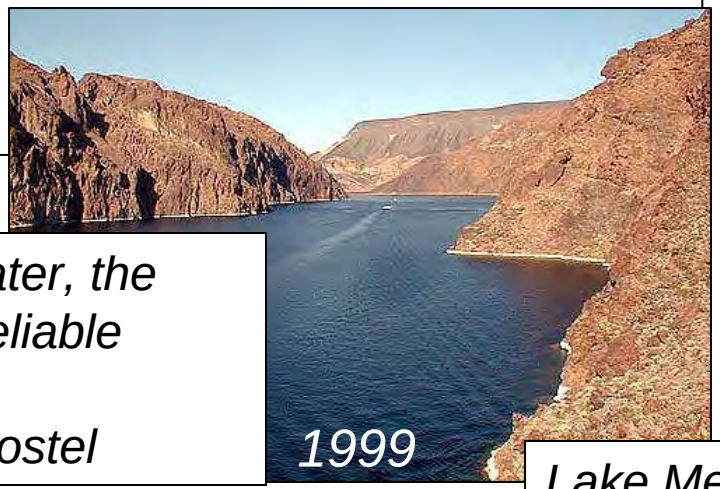
Aging Infrastructure

- 240,000 water main breaks/year.
- 1.7 trillion gal/year lost @ $2.6.
- AWWA targets 15% unaccounted for water.
- ASCE Infrastructure Report Card: D-.
- EPA Gap Analysis: $263B shorfall by 2020.

Pew Center and EPA

Overwithdrawal





1999

Lake Mead, NV

When it comes to water, the past is no longer a reliable guide to the future.

~ Sandra Postel

Galloway et. al. 1999, Life, Inc., SunsetCities.com & Las Vegas Sun

2010

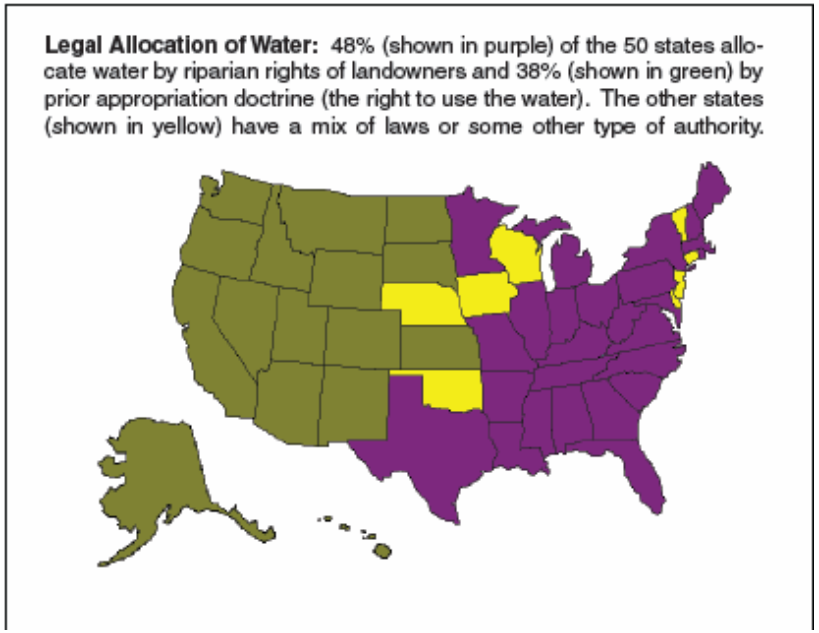
Complex Water Rights

- Determined on the state level.
- Riparian: Eastern states, reasonable use.
- Prior Appropriation Doctrine: first in time, first in right; water rights can be sold.

- *Law of the River (Colorado River)*
- *Appalachicola/Chattahoochee/Flint*
- *Lake Lanier*
- *Tennessee River*
- *Great Lakes Compact*

"I wish to make it clear to you, there is not sufficient water to irrigate all the lands which could be irrigated, and only a small portion can be irrigated. I tell you, gentlemen, you are piling up a heritage of conflict."

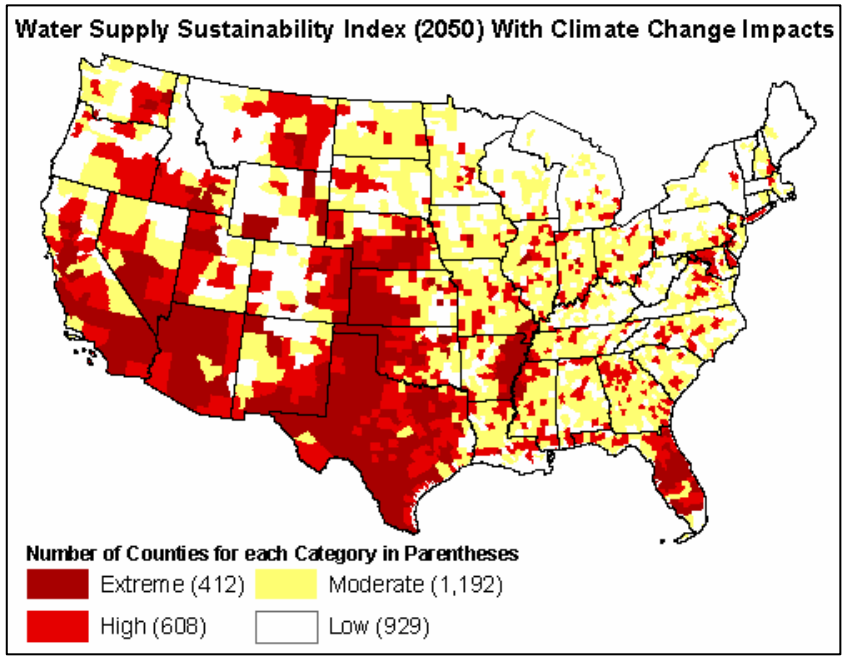
-- Maj. John Wesley Powell, 1893



ASDWA WAVS White Paper Feb2009

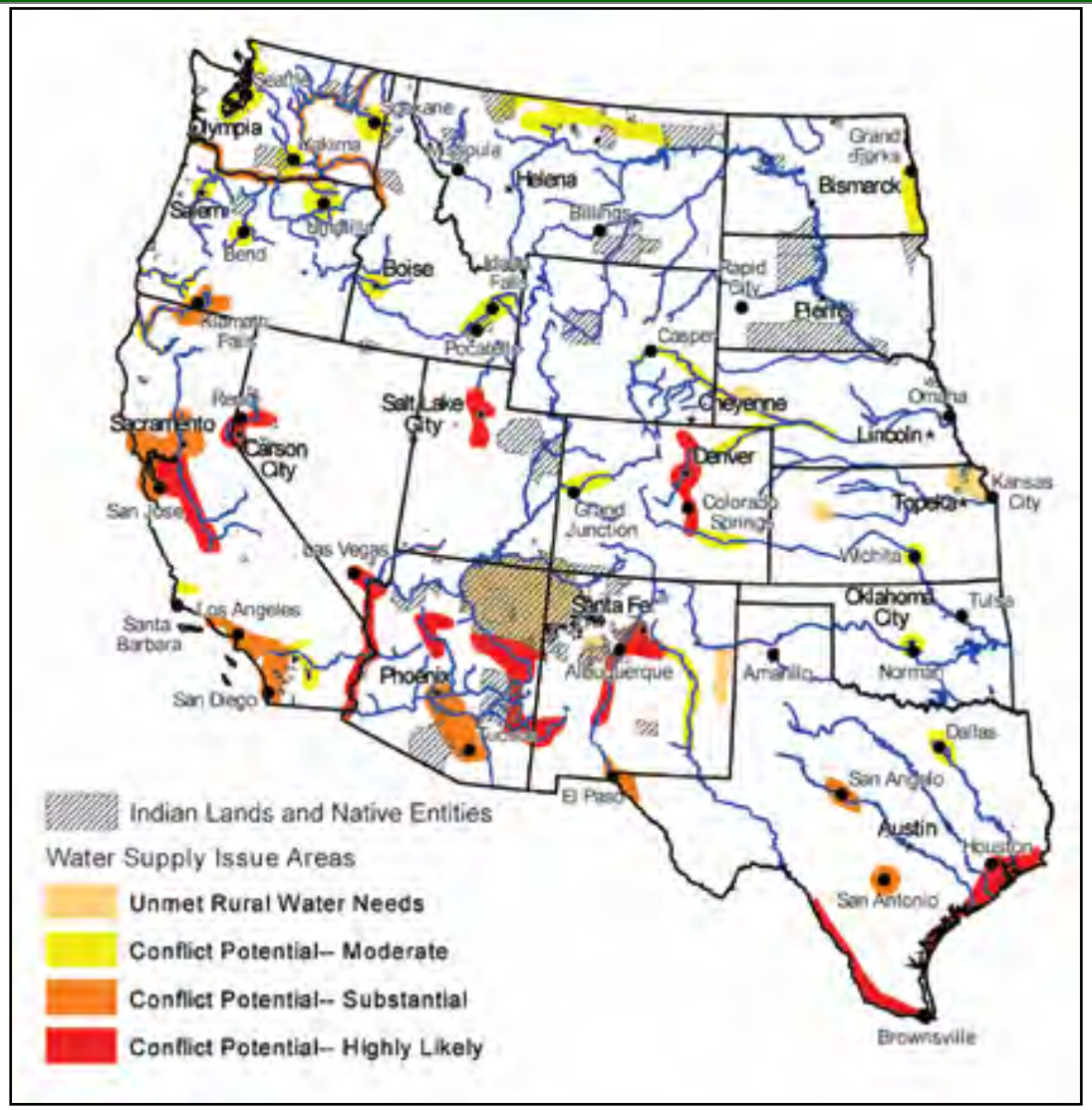
Climate Change Impacts

- Business as usual growth in population and energy.
- Renewable water supply based on 16 climate models.
- Water supplies in 70% of counties may be at risk to climate change.



Tetra Tech, Inc. July 2010

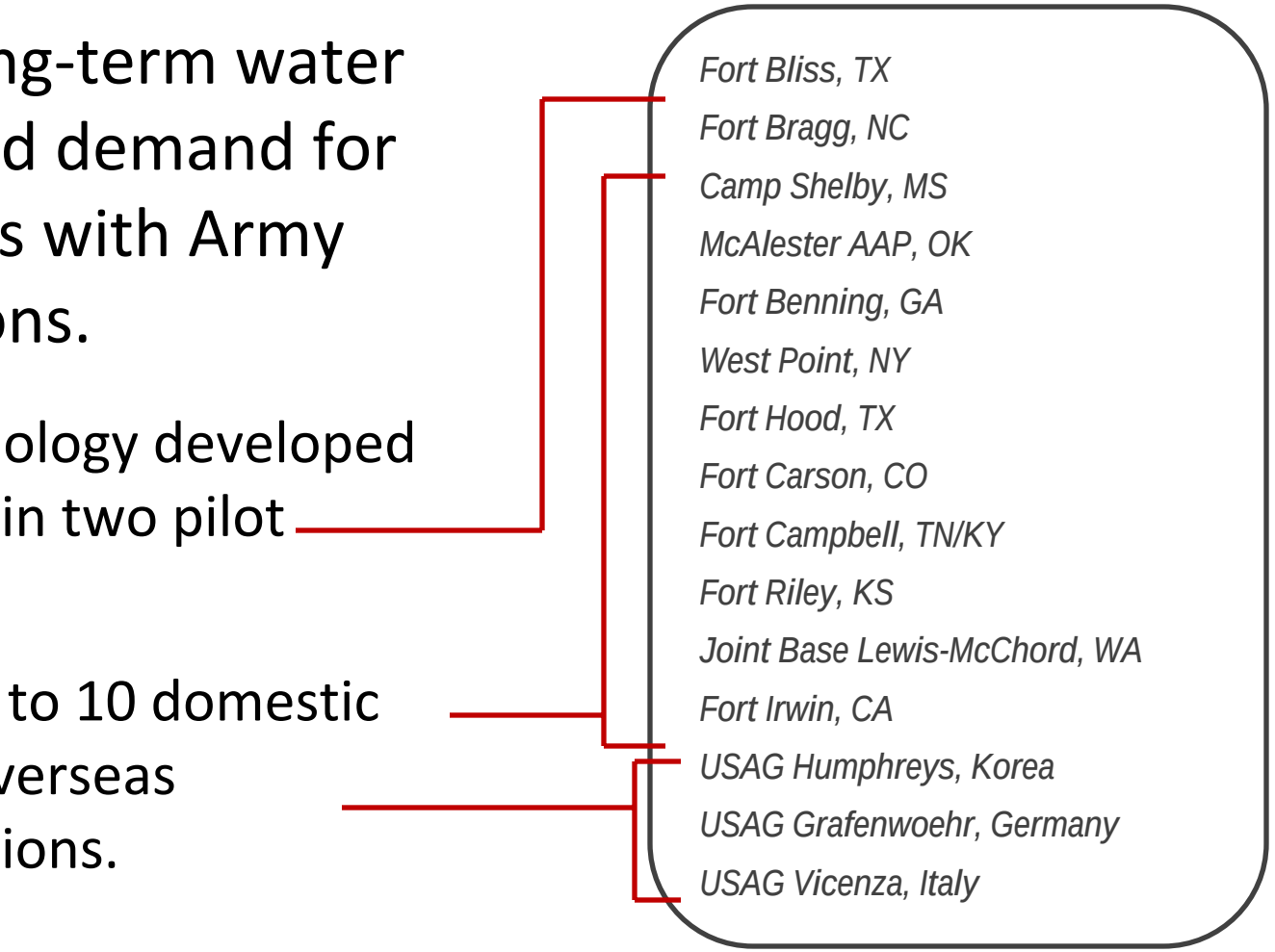
Future Water Conflict Potential



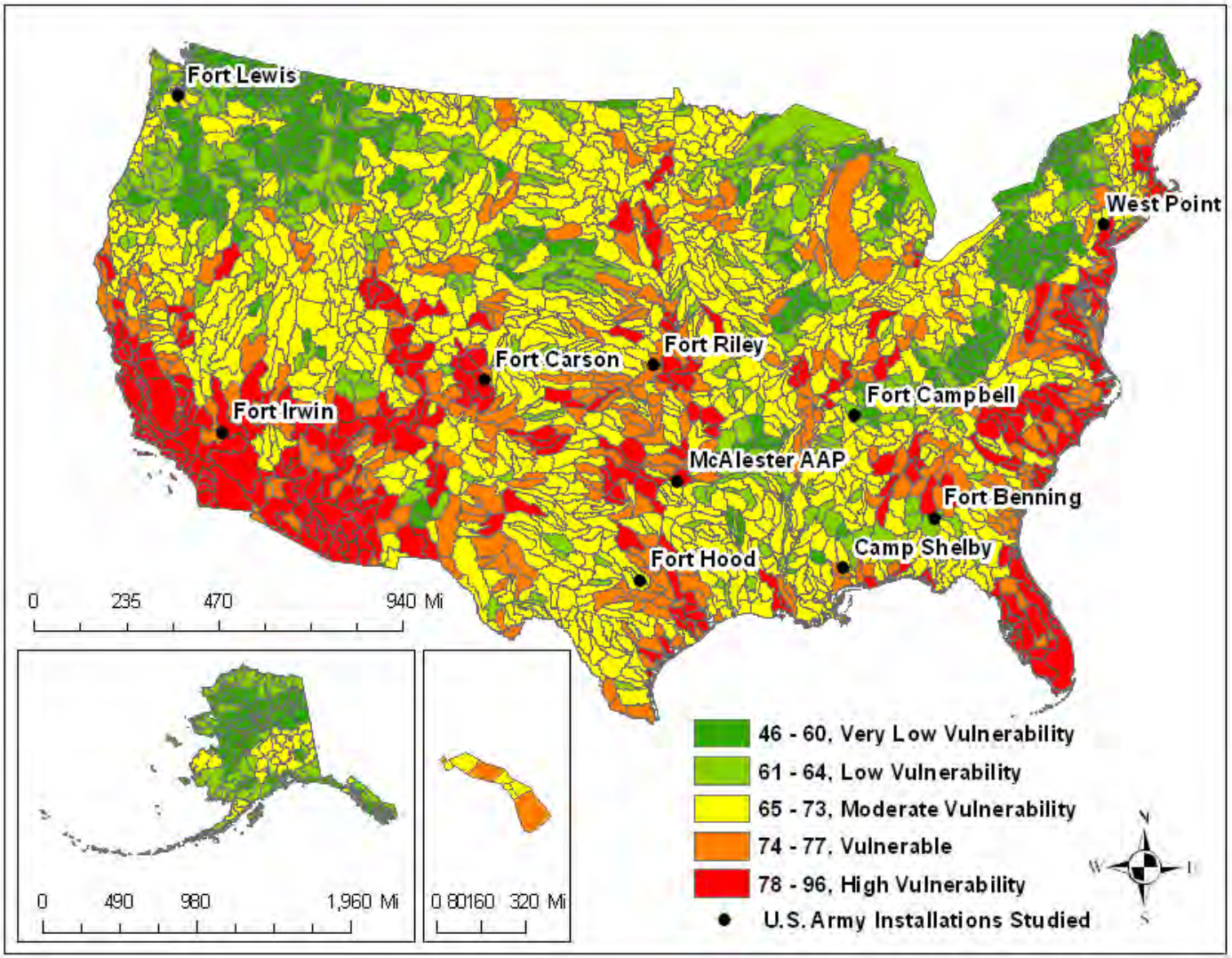
U.S. Global Change Program, 2009

Water Sustainability Assessments

- Assess long-term water supply and demand for 15 regions with Army installations.
  - Methodology developed in 2009 in two pilot studies.
  - Applied to 10 domestic and 3 overseas installations.

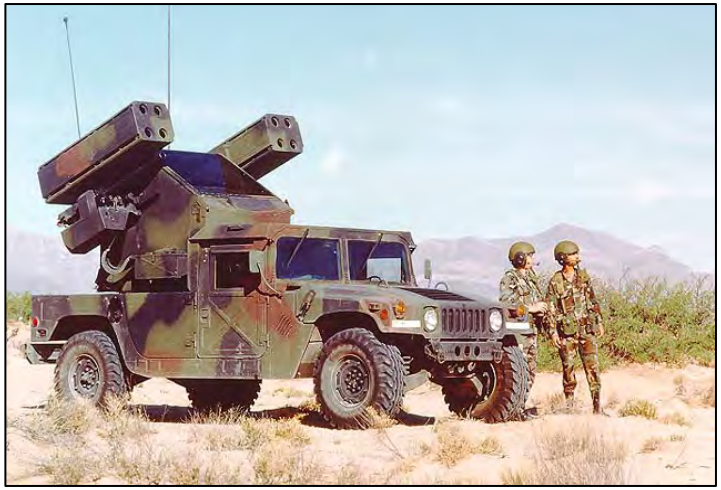


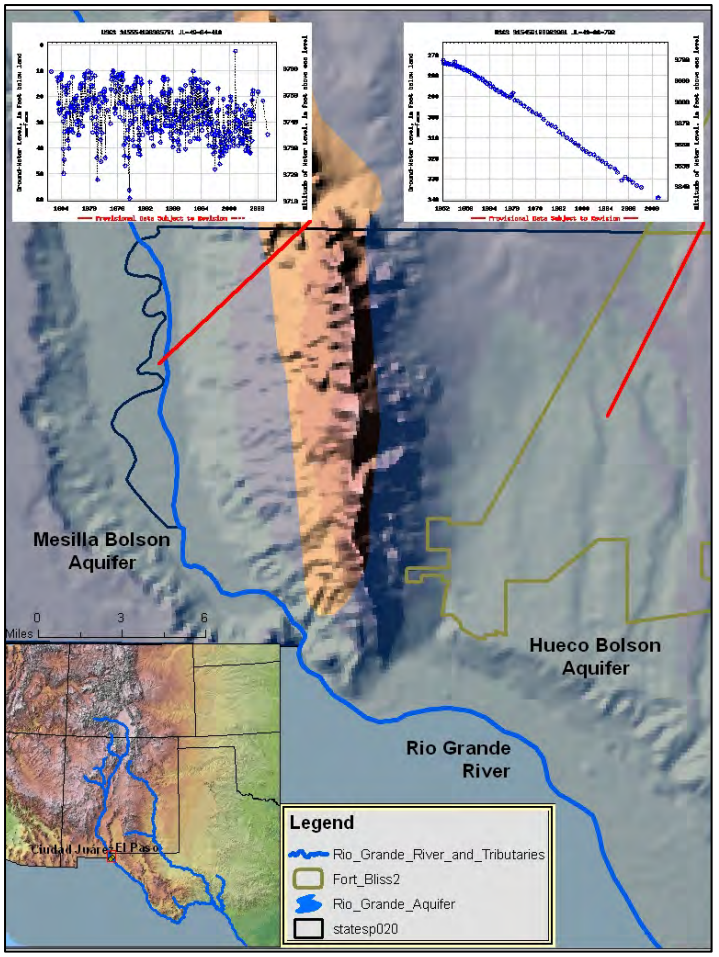
10 CONUS Study Installations



Fort Bliss

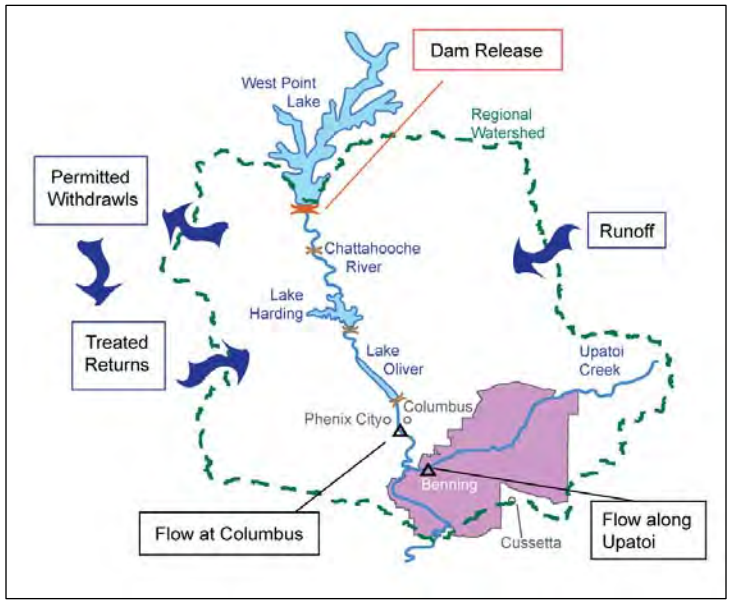
- Largest maneuver area in the U.S.
- 300% increase by 2012.
- State boundaries/International borders.
- Declining aquifers/saline wells.

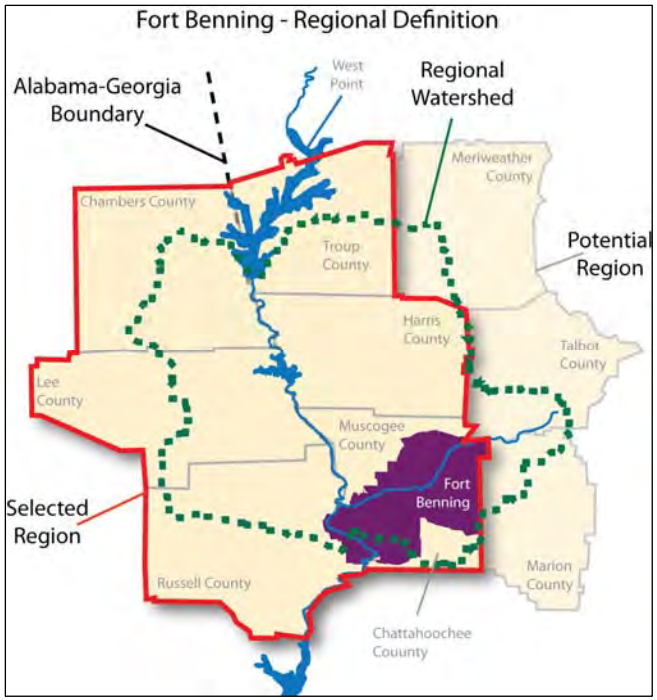




Fort Benning, GA

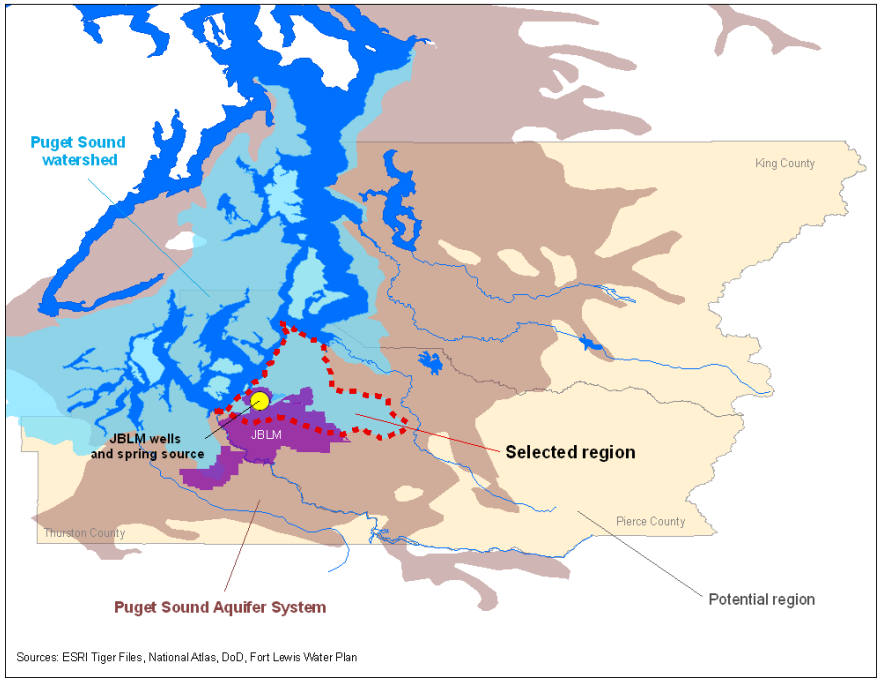
- Large influx of troops and concurrent regional growth.
- Chatahoochee River: historic water disputes.
- History of regional droughts.
- Higher temps and stronger storms.





Joint Base Lewis-McChord, WA

- Combined Army-Air Force.
- 90,000 acres; 35,000 staff.
- High growth region.
- Inadequate recharge despite high precipitation.
- Climate scenarios call for a warmer and wetter future.



Scenarios	Baseline 2005	Climate Change 2040	Increased Demand 2040	Status Quo 2040	Water Efficiency 2040	Stormwater BMPs 2040
Aquifer recharge	68.98	62.08	65.53	65.53	65.53	75.88
Groundwater withdrawals by JBLM	4.14	3.85	3.94	3.85	3.64	3.85
Groundwater withdrawals by rest of region	69.37	84.99	90.01	84.99	63.60	84.99
Yearly gain in aquifer supply	-4.53	-26.76	-28.42	-23.31	-1.71	-12.97

Fort Irwin & National Training Center

- 763K acres in Mojave desert: < 10 inches of rain/year.
- 22,287 permanent troops/5,200 rotational.
- Declining aquifers: arsenic, fluoride, TDS.
- Percolating T2 wastewater into Irwin Basin.
- Water rights.
- 500 MW Solar Project.
- Climate scenarios call for precipitation decrease.

Key Issues

- Even large gains in installation water efficiency will not safeguard supplies for continued use without planning for sustainable water resources regionally.
- Climate change will exacerbate scarcity in arid regions and affect availability in historically wet regions.
- Historic water rights are limiting factors for some installations.
- A holistic approach is needed for achieving energy and water sustainability.
- The Army should take a proactive approach for installations that will experience the greatest climate-driven impacts.